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Representative Animal Life of Indiana

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Before introducing some of the familiar species of animal life of our state, may we pause to outline briefly the general scope of the subject of biology to which these forms belong and, more especially, to review those professional attributes that seem to make for successful instruction in this field.

The study of biology, involving the great forces of the universe that govern the world's population of living things, offers a very stimulating and fascinating adventure. One not only finds oneself an integral part of this complex organization of living things, but wholly dependent for his existence upon an understanding of the fundamental biological laws by which life itself is sustained. This subject offers an important challenge to the teacher in his effort to help the younger generation to define itself sensibly in terms of the universe in which it lives. Such is the opportunity of the teacher of biology and it should not be betrayed.

Biology is a science that deals with living things. It follows that the teacher *is neglecting* his most important approach to success if he fails to utilize to the fullest extent the thousands of forms of plant and animal life in the community as aids in promoting the cardinal concepts of this study. The subject matter is likely to be-

come stagnant and extremely artificial when merely gleaned from the conventional pages of a textbook with no color added from first-hand contacts of the teacher and pupils themselves during the course of this endeavor. Work of this kind is wholly without a genuine soul or conscience and often precipitates professional chagrin on the part of the teacher; the real spirit of the subject is dissipated and the opportunity to do a very beautiful piece of work is likely to be swallowed up by some dry, stereotyped, and often capricious venture that only by the most liberal use of the English language could be called biology. Such a teacher is to be pitied as a stupid firefly groping in the dark with his potential light at hand, while genuine sympathy is due the pupils that fall victim to such unfortunate direction.

It is readily conceded that the teacher of biology should have a rather broad training in this field, and that no textbook alone, regardless of its merits, will suffice. The instructor must have felt the experiences himself; his instruction should bear some of the marks of his own fingerprints.

It is true that pupils can be driven by fear of failure to receive credit, to cram standardized definitions, or to acquire a generous store of orderly arranged memory gems in much the same way that the parrot

learns to imitate his associates. This type of intellectual veneer is of the thinnest kind and of very little consequence. Liberally speaking, it may contain fragments of what might be termed a general store of information but certainly little or no wisdom. Information without contacts is not only of questionable value, but may easily become exceedingly dangerous to the recipient. The study of biology, animal and plant life in general, is hardly more of a textbook course than the study of aeronautics or of surgery. One can hardly imagine either of these fields as being represented by men who have prepared themselves for their work by correspondence or any other form of remote control.

We are forced to recognize that the methods employed in teaching the more or less conventionalized subjects of the curriculum may not adequately suffice in dealing with biological materials. A textbook and a blackboard are the most barren type of equipment in science when used alone; however, both may have value in their proper places.

It should be properly emphasized that technique is only a means to an end and not the end itself, and when technique assumes the leading role in this great drama, the pupils are likely to become very easily and unpleasantly fatigued. It is generally understood that the successful biology teacher, in addition to a well-groomed technique in the presentation of the subject matter, should have a very broad and substantial training in the subject matter itself and, above all, should love to associate with the world of natural objects about him in such a way that his soul is somewhat permeated by their presence. The biology teacher that is possessed of this combination of professional attributes is rather difficult to describe, but certainly very easy to recognize. It is from this type of instructor that the pupil in biology is likely to inherit inspiration that will carry far beyond the final examination. On the other hand, it is rather difficult to share with a teacher that which the teacher himself does not have, and the pupils are soon conscious of just such a disappointment.

It should be remembered that high school instruction in biology is not intended to

produce specialists in the field, but to present only a friendly introduction to the universe in which we live. It is believed that a rather liberal compromise should be reached between the point of view of the experimentalist and that of the naturalist. In much science instruction in the last few years, the dollar-and-cents idea has so dominated certain educational trends that it has become popularly understood that the value of an education should be measured chiefly in terms of increased earning capacity. Much of the beauty of the natural objects of the universe has been obscured completely, in many instances, by the huge dollar signs introduced into the picture by the tenor of a group of purely monetary-minded individuals of our generation. It is believed that a serious injustice is tendered our boys and girls if the opportunity to sense the beauty and interest in nature for its own sake is denied them.

It shall be the purpose of this discussion to offer a few suggestions and helps which, it is hoped, may be of some value in executing certain units incorporated in the state course of study for teaching biology.¹ Unfortunately many of our young people feel that they know more about mammals and reptiles of the Kongo than about the animal life in our own state. Many spectacular explorers have so popularized these remote regions that their findings have almost monopolized the pages of some of our textbooks. An effort will be made here to introduce a few of our Indiana forms which furnish a fascinating study for those who know them.

Unit V in the *State Course of Study* places special emphasis on the biology of insects and Unit VI deals primarily with the vertebrate animals. Any community is teeming with representatives of these groups and a wonderful opportunity is afforded for the study of these forms at first hand. In fact, these animals are so abundant that one feels somewhat apologetic for

¹*Tentative Course of Study in General Science, Biology, Physics, and Chemistry for Indiana High Schools.* State of Indiana, Department of Public Instruction, Bulletin No. 100-E.

selecting certain species and discriminating against others in presenting this discussion.

INSECTS

Insects may be readily identified by the presence of six legs, one pair of antennae, a chitinous exoskeleton, and usually two pairs of wings. This class of animals is everywhere abundant and in numbers exceeds any other group in the animal kingdom. Insects enter into almost every phase of human life and by many have been characterized as the greatest competitors of the human race in the struggle for existence. The food of insects is comprised of the most unusual variety of materials including cured tobaccos in the stores and warehouses, materials of overstuffed furniture, grains in the bins, cotton in the bolls, woolens in clothing, timbers of buildings, foliage and fruits of all our agricultural crops, human blood, and, peculiarly enough, bodies of other insects.

On the other hand, man depends upon many of these little animals to turn the wheel in his favor. The honey bee prepares one of our delicate foods and others cross-pollinate our plants. The busy little silk worms spin the fibres of our natural silks. The dragon flies or "snake-feeders" destroy flies and mosquitoes, and the demure little ladybug beetles carefully glean the plant lice from our flowers while the praying mantises or "devil's horses" diligently ply their trade devouring grasshoppers and other destructive species of this tribe. It is not commonly known that the fireflies and ground beetles also lend their assistance to man by feeding voraciously upon many other destructive insects.

In fact, the insect kingdom offers such a rich store of interesting biological phenomena that its study should represent an important place in high school biology. The almost miraculous transformations of insects during metamorphosis, the beautiful social order in the ant colony and beehive, the skill in cocoon formation among our beautiful moths, commensalism among ants and aphids, parasitism and its importance among the members of the group itself, protective mimicry, and many other activities, some of which almost approach human intelligence, offer valuable material

for capturing the interest of young exploring minds.



Photo No. 1. Tomato worm (*Phlogistus quinquemaculata*) with cocoons of a parasite on its back.

Tomato worms (Photo No. 1) are frequently seen during the summer and autumn with clusters of small white oval-shaped bodies attached to their backs. Every wide-awake boy has conjectured freely as to the significance of the rather unusual sight and the usual conclusion reached is that these small white bodies are the eggs of the insects that have been superimposed upon the mothers' bodies for protection and incubation. This conclusion is erroneous; hence the opportunity to appreciate an almost universal principle or phenomenon of nature, actually in progress, escapes the observer completely. These little white bodies are the cocoon stages of numerous parasites that have finished feeding as maggots within the body of the tomato worm, emerged, and pupated upon its back.

It should be remembered that the tomato worm is just a baby or larva of the species and does not lay eggs at this stage. Later this tomato worm, after pupating in the ground for a period, will appear as a large gray moth which resembles the hum-

ming bird in many respects. The moth may be recognized at its familiar haunts, poised on wings like the little humming bird, drinking nectar from the flowers with its long beak-like proboscis about dusk. It is at this stage that eggs are again placed on tomato plants, hatched into tiny worms, and the cycle of the tomato worm is again under way.

In the schoolroom the tomato worm bearing the cocoons of the parasite can be confined to a glass jar covered with muslin and fed on moist tomato leaves in order to observe the small fly-like parasites emerge through tiny holes cut in the white cocoon. After mating, the female parasites are in readiness to parasitize other tomato worms. This process may be observed by promptly introducing young tomato worms into the container with the parasitic flies. Moreover, the parasite in its maggot or larva stage may be easily examined by opening a number of tomato worms brought in from the garden. Often hundreds of maggots can be found living and feeding parasitically within the body of a single tomato worm.

The parasite, in addition to its economic value in controlling the tomato worm pest, exhibits a general biological principle, that of parasitism, which has almost universal application. Ranging from the internal and external parasites (such as worms, flukes, lice, fleas, molds, bacteria, etc.) of the human race, of dogs, of cats, of birds, of reptiles, of fishes, of frogs, of insects, and on down the scale to the tiniest forms of plant and animal life, all forms of life have their natural enemies with which they must contend in their struggle for existence. When one organism lives upon the body of another, the host, to the detriment of the latter, the former is technically known as a parasite. Even bacteria, very tiny microscopic one-celled plants, in size far beyond the unaided senses of man, have what is believed to be some sort of a parasitic or lytic agency which even destroys them. It is known as the bacteriophage. Malarial fever is caused by a tiny microscopic parasitic animal, *Plasmodium vivax*, so small that it is possible for it to live within the red blood cells of man and produce their destruction.

Of course, it is needless to say that many forms of parasitism have been put to work by man in accomplishing certain desired ends, while other forms present very vital problems which not only place man himself in extreme jeopardy, but often actually demand his life. The hookworm disease in the South, the fluke diseases of China, tuberculosis, yellow fever, and sleeping sickness of the tropics, are only a few examples of parasitism that knock directly at the door of man and play a vicious role in human distress.



Photo No. 2. Praying mantis or devil's horse (*Stagomantis carolina*).

The *praying mantis* (Photo No. 2) is another very common insect that occupies a rather spectacular place about the home-stead. This insect, like the dragon fly or snake feeder, despite all the weird stories and superstitions which have given rise to the name "devil's horse," is not only absolutely harmless, but is one of man's best agencies in combating insect pests about the home. The large staring eyes in a head perched at the end of a long pole-like neck, the large vicious front legs with the numerous claw-like barbs exposed, and the folded position of the forelegs, as if in a sombre attitude of prayer, have incited much fantastic conjecture. In fact, its at-

titude does indicate that it is in position and mood to *prey*, if a grasshopper perchance darkens its path, but not to *pray*. It is a cannibal or a carnivorous animal and does much good by feeding voraciously on other destructive insects. Its value has been so recognized that foreign species have been imported, propagated, and released in certain sections of the United States.

The mantis serves as an excellent example of the carnivorous activities of certain insects. At dusk the mantises may be seen, awkwardly flying about from tree to tree, and may be collected easily for laboratory studies. When confined to a small box together with a few grasshoppers, these little carnivores readily demonstrate their skill in capturing and devouring their prey. It is significant to note that one of the most promising possibilities for the future control of insect pests is by the use of such natural enemies as insect diseases, parasites, and such carnivorous insects as the mantis, ladybug beetle, aphis lion, dragon fly, and many others.

Space will not permit a detailed discussion of the various things that can be done with this phase of biology in the high school. Only a few of the more striking activities can be mentioned. It should be clearly demonstrated to every boy and girl that the wiggle tails from the rain barrel develop into adult mosquitoes and that maggots from the garbage turn into the common house fly. Both of these insects are dangerous and their life habits should be well understood. The complete metamorphosis of some of our common butterflies such as the black swallowtail, which develops from the banded larva found on the carrot tops, or the cabbage butterfly that evolves from the little green cabbage worm, offers excellent material for laboratory study. Pupils will enjoy making a substantial collection of our beautiful moths and butterflies and collecting cocoons about March, before the leaves appear on our trees, in order to watch adult moths emerge during the spring. These and many other such exercises should help materially to make the classroom recitation worth while.

FROGS AND SALAMANDERS (CLASS—AMPHIBIA) IN GENERAL

This class of animals, Amphibia, is represented relatively by only a few species. There are some eight times as many species of fishes, four times as many reptiles, and some ten times as many species of birds. In the great trend of organic development, this group was responsible for the change from a life in water to a life on land when the earth was in position to support life on land. Frogs and salamanders still live a dual life. The young live in water and breathe with gills like the fishes. Later they develop lungs which equip them for life on land. They have been limited in distribution to regions near water and consequently suffer tremendously during periods of drought. Moreover, dry arid tracts have made their migration to remote regions impossible. Since they are cold-blooded animals and become inactive in a cold climate, the doors of the far north have been completely closed to them.

The frogs and salamanders are not as perfectly adapted to water as are the fishes, nor are they as fully independent of water and adapted to land as are the reptiles. Hence their destiny has been pitted between two vicious enemies that feed upon them. The fishes devour the larvae or tadpoles in the water; the reptiles feed voraciously on the adults during terrestrial life. These precarious conditions depict a pathetic picture for the future of the group.

Notwithstanding the diminishing of species due to the natural hazards of life, the chorus of the frogs in the springtime indicates the presence of many of these little friends of man about the home. Their lives are very interesting and deserve an introduction to our boys and girls at this time.

Reproduction.—Frogs and salamanders as early as March begin the task of reproducing their young in sufficient numbers to commensurate for the casualties of the previous year. The eggs are laid in water, as many as 10,000 to 12,000 in the case of our common American toad (*Bufo americanus*). The eggs appear as round black dots suspended in a gelatin mass,

either in large masses or in continuous unbroken ribbon-like strings depending upon the species. The jelly-like material about the eggs helps to maintain an even temperature during incubation and also serves to convert the egg into a slippery unmanageable mass not easily seized by the enemies that devour them. The leech, perhaps the most severe enemy of the frog at this stage, penetrates the covering and sucks the contents from thousands of the eggs.

The male frog deposits the sperms in the water adjacent to the eggs and after fertilization the eggs hatch into tadpoles with gills and tails but no legs. As development proceeds, the rear legs appear; the left front leg and then the right front leg is formed; the gills are transformed into lungs; the tail is gradually absorbed; the tadpole is now a frog. Further development is largely an increase in size. Many of the species as adults become divorced entirely from water and make their homes upon land until the breeding season of the following spring.

The marvelous transformations during the development of the frog from the single-cell stage of the egg through the tadpole stage to the adult can very easily be demonstrated in properly constructed aquariums or by frequent visits to small stagnant pools in the vicinity.

Hibernation.—Where and how do frogs struggle through the bleak bitter months of winter? The sight of a frog juggling its body through the ripples of a cold stream in late autumn invariably suggests this thought. It should be remembered that these animals, similar to reptiles, are cold-blooded, that is, they possess no physiological mechanism for maintaining a constant body temperature. The temperature of their bodies varies with the surrounding medium. With decreasing temperature, respiration, circulation, and other life processes are diminished until finally quiet, then sleep is induced. Frogs and salamanders can endure astonishingly low temperatures—even freezing in ice will not of necessity produce death. Unless the blood and tissues of the heart completely crystallize and fall well below freezing, the little spark of life residing there will revive and the frozen parts recover.

In autumn when the frog feels this slowness or inactivity of life processes dawning, he creeps away into seclusion in protected places or into the mud and debris at the bottom of ponds, and drifts away into quiet repose to be awakened with his many friends by the reviving warm rays of sun the following spring.

FROGS AND TOADS (ORDER—SALIENATA)



Photo No. 3. Fowler's toad (*Bufo fowleri*)—body length, $2\frac{1}{2}$ inches.

Fowler's toad (Photo No. 3) is one of two very common species of hoptoads in Indiana, Fowler's toad and the American toad. The life habits of these two interesting forms are very similar and, even though they bear a rather unique resemblance, they can be readily distinguished. The American toad is shorter and heavier than Fowler's toad with tinges of rich yellow, orange, or reddish brown on the body, and with large *conspicuous warts* scattered about the surface of the skin. Fowler's toad usually has a greenish tinge on the body, never orange nor yellow, and has several very small warts within each dark blotch on the skin. The under parts of Fowler's toad are never spotted as in the other toad.

Toads are excellent destroyers of insects. These little creatures lie in quiet repose during the day, but about sunset they begin the customary survey of the lawns and

gardens for insect prey. The tongue is attached at the anterior end and can be thrust quickly out of the mouth at insects lurking within striking distance. The insects readily adhere to the sticky surface of the tongue and are rapidly pulled into the mouth and swallowed.

An inventory of the regular daily menu of a toad shows the following items: crickets, flies, mosquitoes, May beetles, garden slugs, plant lice, army worms, cut worms, and many other species of caterpillars. It is estimated that approximately ninety per cent of the toad's food consists of destructive insects. In terms of dollars and cents, a single toad is valued at approximately twenty dollars if the damage done by a single cut worm or army worm be calculated at one cent per year per insect.

Toads and frogs secrete from the skin a poisonous material which acts as a repellent to their invading enemies. Most of us have observed the antics of a dog slobbering at the mouth after seizing a toad. Many animals, such as the snake, seem to disregard this distasteful excretion and feed sumptuously upon frogs. The skunk, cum-

eating it. The poison has an irritating effect on mucous membranes; it does the human body no harm at all unless rubbed into the eyes or on other mucous membranes. The old tradition that frogs produce warts on the skin is erroneous. The liquid waste released by a frog when agitated is from the urinary tract and has no connection with warty skins.

Common tree frogs (Photo No. 4) are easily recognized by the pads at the ends of their toes. The most clever little acrobat of the frog world is the little common tree frog. The sticky pads on his feet and his acrobatic skill make it possible for him to recover from the most precarious positions, often dangling frantically from a twig by a single toe. This little fellow is also insectivorous and may be seen quite frequently making a flying-tackle at an insect with little or no regard as to where he is to land. His antics and gymnastics while capturing his prey offer hair-splitting thrills for the observer.

The little tree toad can be found generally distributed about the homestead, calling more enthusiastically on damp humid days. Accordingly, he has been characterized as a weather prophet. The protective coloration of his body has enabled the tree frog to escape very general notice. His appearance is much like that of a clump of the inconspicuous greenish-gray lichens or putty on the limb of the apple tree or clematis about the porch. The tree frog is not particularly wild or retreating but, to the contrary, is very easily caught when found. The difficulty is in locating him. He appears very happy in captivity.

The tree frog, characteristic of the frog group in general, does actually change color. The color change is produced by the contraction and expansion of pigmented cells, chromatophores, of several colors in the skin. When the black pigmented cells expand and spread over the body, the other colors are masked and the frog becomes darker. When the black pigmented cells contract, the other color cells show through and the color changes qualitatively according to the amount and kinds of pigments predominating. This property of changing



Photo No. 4. Common tree frog (*Hyla versicolor*)—body length, 2 inches.

ningly enough, has learned to roll the toad rigorously on the ground and grass before

color adds to a protective blending of the animal with its surroundings.



Photo No. 5. Leopard frog (*Rana pipiens*)—body length, 3½ inches.

The leopard frog (Photo No. 5), so called because of its spots, is one of our most beautifully colored frogs. It can be recognized by the rounded, blackish-brown, light-edged spots superimposed upon some shade of a greenish body. Two parallel bright golden-yellow glandular folds or ridges extend down the sides of the back from the eyes to the posterior end of the body. The under parts are white, becoming somewhat yellowish posteriorly.

The leopard frogs are among the most common Indiana forms. They are among the first to appear in the spring with the bluebirds and are the latest to retire in the autumn. During the summer they may wander some distance from water in search of insects, upon which they feed abundantly. Grasshoppers form one of their choicest desserts. The adult travels by extraordinarily long leaps, usually several in succession when disturbed. Strange enough this frog's voice is musical. The young vary greatly in color—even some are devoid of the spots, but the glandular folds, just described, are always present.

This species seems very happy in captivity

and is easily tamed. It consumes food willingly and makes adjustment rather rapidly to the school aquarium.

The pickerel frog (*Rana palustris*) resembles the leopard frog somewhat, but is not so common in Indiana. The pickerel frog is smaller, the glandular folds not so bright, and the back portion of the abdomen and thighs is a bright yellowish-orange color; also the spots on the body are somewhat square or rectangular in form, as a rule, rather than rounded. The life habits of the pickerel frog are rather similar to those of the leopard frog.



Photo No. 6. Green or grass frog (*Rana clamitans*)—body length, 3½ to 5 inches.

The green or grass frog's (Photo No. 6) body is usually metallic green in color with some dark mottling on the sides and faint bars on the thighs. The side of the face is a bright yellowish-green and the tympanum (ear) is brown. This frog is not spotted. Regardless of size, age, or color, the green frog can be distinguished from the other species by the character of the glandular folds on the back as follows:

1. Leopard frog—glandular folds conspicuous, bright golden-yellow and extending full length of body.
2. Grass frog—glandular folds less con-

spicuous, dull, and extending about one-half length of body.

3. Bull frog—no glandular folds at any age.

The green frog is one of our most common frogs and confines itself largely to the immediate vicinity of water. It is this fellow that leaps high into the air and with a low-pitched ka-tun-n-ng disappears gracefully into the stream below.



Photo No. 7. Common bull frog (*Rana catesbeiana*)—body length, 8 inches.

The common bull frog (Photo No. 7) is the largest of our Indiana frogs. There are no conspicuous markings on his greenish body and the glandular folds are absent. The large adult size makes this frog's identification easy.

This species has been popular for sometime as an article of food and, in numbers, has suffered accordingly. The bull frog emerges from winter quarters rather late in the spring; yet on a still warm summer night the resonance of his deep bass voice occupies a familiar place in the chorus of water life about the marshes and lakes of our state.

The feeding habits of the bull frog are confined to the pond or lake in which he resides. He does not wander away in quest

of food. The bull frog is the cannibal in the frog world. He not only feeds on small fishes, water insects, crayfish, and the like, but he draws no line on devouring one of his own group. This point was properly emphasized to the writer when leopard and green frogs were placed in an aquarium with one of these big fellows. The bull frog very greedily swallowed his cousins whole with a single "lick of his chops." This august-appearing water king is a powerful swimmer and diver with a tremendous drive in his rear legs.

SALAMANDERS (ORDER—URODELA)

The salamanders differ from their cousins, the frogs, in that the former have tails and that both pairs of legs are approximately the same size. In the case of frogs, of course, the rear legs are developed into powerful instruments for swimming and jumping. The tails of those salamanders that prefer land as adults are usually rounded, and the tails of those that prefer water are flattened, as might be expected.

Salamanders are quite commonly confused with lizards which they somewhat resemble in body contour and shape. The following characteristics make it possible to differentiate readily between the two groups:

1. The bodies of salamanders are smooth and usually slimy, whereas those of lizards are covered with over-lapping scales.
2. Toenails are absent in salamanders and conspicuously present in lizards.
3. The eggs of salamanders are laid in water and develop into tadpoles quite different in appearance from the adult, while the eggs of lizards are incubated in debris or soil and hatch into miniature lizards, in form much like the adults.

It should be noted at this time that the *horned toad* of the Southwest is not a toad at all, but a lizard. It is not poisonous, as is commonly believed, but an absolutely harmless little insectivorous reptile.

There are many species of salamanders in Indiana, all of which are harmless, docile specimens. The eggs are deposited in water and development proceeds much as in the case of frogs.

The slimy salamander (Photo No. 8) is an anthracite black with small white dots on the body. The body is very slippery and covered with a glue-like substance; hence the specific name *glutinosus*. This species

fans at the side of the head. This species attains considerable size, well over a foot in length; but is just a big, awkward, good-natured fellow—perfectly harmless. Specimens can usually be obtained in late fall



Photo No. 8. Slimy salamanders (*Plethodon glutinosus*)—body length, 6 inches.

is very abundant and can be obtained readily in the fall from old decaying logs and stumps adjacent to streams.

The tiger salamander (Photo No. 9) is larger than *glutinosus*. The body color is dark olivaceous brown with a number of rather large rounded yellow spots. The flattened tail indicates a preference for water. This species is usually found around old, shallow, open wells, open vaults, and damp cellars. It feeds upon worms and insect life in the water and readily makes adjustments to pools or aquariums about the laboratories.

The mud-puppy is one of the most spectacular representatives of the group. This queer animal has aroused the curiosity of all fishermen. It is the large, awkward, good-natured mud-puppy that is frequently found on the fishing tackle. The mud-puppy is very fond of fish which accounts for its being ensnared by the fisherman's tackle. It is a lichen-gray with a pair of blood-red external gills waving like



Photo No. 9. Tiger salamander (*Ambystoma tigrinum*)—body length, 8 inches.

from fishermen who are deep-casting for game.

REPTILES (CLASS—REPTILIA) IN GENERAL

Reptiles, like the hawks and owls, represent one of the most unpopular groups of animals in Indiana. For generations our people have been taught and disciplined carefully, beginning at the crib, to fear with trembling this dreadful group of animals. This teaching has had a profound effect. A universal crusade has been ruthlessly waged against all species alike, stimulated by many erroneous stories and by the lack of correct information about the life habits of the group in general. The sight of a perfectly harmless little garter snake almost freezes the blood in the average individual. A hysteria of fear musters a powerful imagination into the foreground, hence the seeds of tradition are broadcast profusely on a very fertile soil for some of the most fantastic experiences and stories conceivable. Fright and its running mate,

imagination, are two very unreliable scientific instruments.

It shall not be the purpose during the course of this short article to make a sensational appeal for the reptiles of our state, but merely to submit a few general unbiased opinions about the members of this group.

Snake Stories.—Many fantastic and spectacular stories are current among us about such incidents as: snakes swallowing the young for protection, stealing large quantities of milk from cows, charming birds and even people, and the traditional "hoopsnake" that supposedly rolls with a tremendous velocity at the enemy and sinks a deadly fang carried at the end of the tail. Space will not permit a thorough discussion of the improbabilities of these cases, but it will suffice

five timber rattlers, and one prairie rattler. Three of the copperheads were obtained near Bridgeton; one at DePauw in Harrison County; two at Hoosier Highlands near Greencastle; and four in Brown County. The timber rattlers all came from Brown County. The prairie rattler was found near Cedar Lake in northern Indiana this summer.

It has been reported that a few specimens of the cotton mouth, the true water moccasin, still inhabit the streams and bayous at the extreme southern boundary of the state. Circumstances render these reports of questionable value. The cotton mouth is native to the southern states.

Venomous snakes of Indiana can be easily distinguished from the harmless species by the following characteristics:

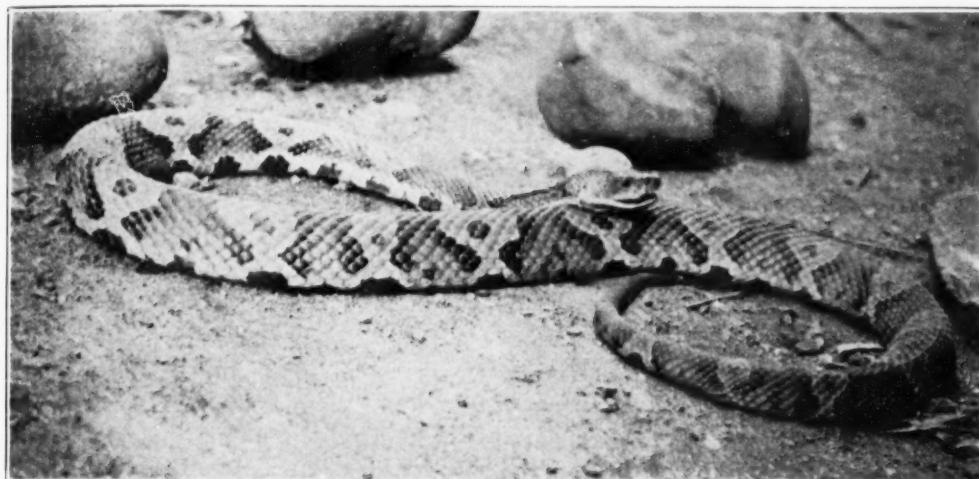


Photo No. 10. Copperhead snake (*Agkistrodon contortrix*)—body length, 30 inches.

to say that none of these stories will bear scientific investigation. The observations of such imaginary phenomena usually have had birth among individuals possessed of a profound fear and trembling at the sight of the most harmless species.

Poisonous vs. Non-poisonous Species.—There are only a few venomous snakes remaining in Indiana, the stragglers of three lone species, the copperhead, the prairie rattler, and the timber rattler. Of some five hundred individuals collected during the last five years, only fifteen specimens were found to be venomous—nine copperheads,

1. Venomous species have slit-shaped pupils in the eyes—those of the non-venomous are round.

2. Poisonous species have deep pits between the eye and nostril—absent in the non-poisonous.

3. Venomous snakes have fangs, a pair of long venomous teeth in the anterior end of the upper jaw—absent in the non-venomous.

The coral snake of the South, a beautiful but venomous little species, violates this code in that the pupils of the eyes are round and the pit between eye and nostril

is absent. Otherwise, the code of venomous characteristics holds good for the species of the United States as a whole.

It is understood, of course, that the forked organ protruded from the mouth of a snake is not its fang, but its tongue and has nothing to do with the injection of venom. This organ is probably auditory in function.

SOME COMMON SNAKES OF INDIANA
(SUBORDER—SERPENTES)

The copperhead snake (Photo No. 10), one of the poisonous species, is sparsely distributed in the state. It can be readily recognized by the saddle-shaped or hour-

The copperhead is called the highland moccasin because of its predilection for high and dry rocky regions. It gives birth to a small brood of young, usually from six to nine in number. Its food consists chiefly of birds, small rodents, frogs, and occasionally, other small snakes.

The timber rattler (Photo No. 11) is one of the other venomous species found in Indiana. The presence of rattles, first of all, identifies it. The body color is a smoky yellow with black, white-edged, chevron-shaped blotches on the back. Posteriorly the tail becomes black. The rattlesnakes, too, give birth to young in small

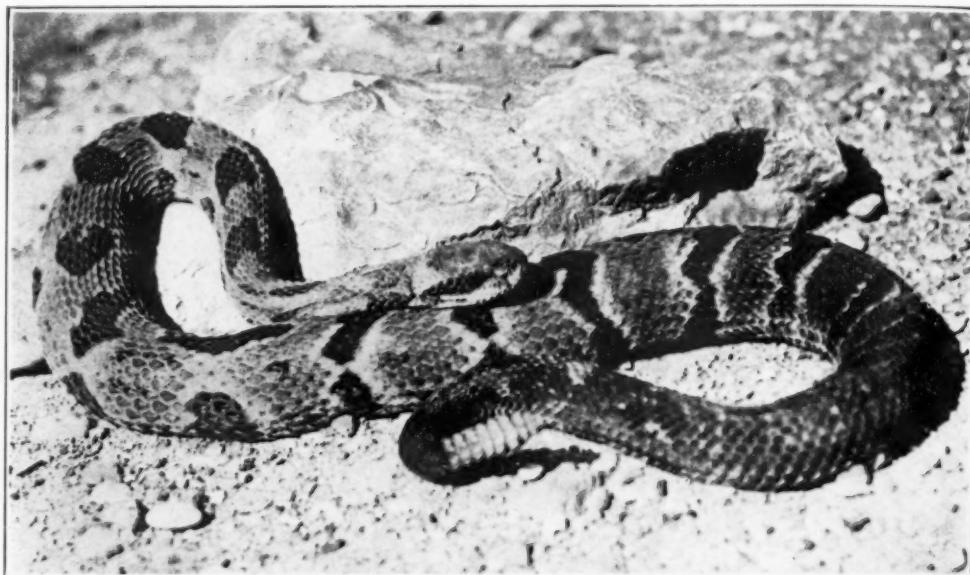


Photo No. 11. Timber rattlesnake (*Crotalus horridus*)—body length, 5 to 6 feet. glass-shaped blotches of chestnut brown over the back and the copper-colored head. Of course it possesses those general characteristics of poisonous snakes: slit-shaped pupil in eye, pit between the eye and nostril, and fangs.

The copperhead is a treacherous reptile and never spars with an adversary before striking. This creature throws itself into a figure *S* and strikes simultaneously. It is not aggressive, and it never attacks unless the chances to lurk into cover are cut off. It is very venomous and should be carefully guarded.

broods of from nine to twelve. Their food consists entirely of warm-blooded prey, such as small rodents and birds. The partially digested body of a brown thrush was regurgitated by a large specimen on one occasion when brought to the laboratory as a captive.

Poisonous snakes, as a rule, are not aggressive; they move very slowly, usually no faster than an ordinary walk. The strike usually does not exceed one-half the length of the body.

The prairie rattler (Photo No. 12) prefers the tillable agricultural lands of Indiana; hence it has encountered many obstacles in its struggle for survival. These animals have met with death in such numbers at the relentless hands of the farmer that only a few individuals remain as the last leaves upon the species tree. Those that have survived are confined to regions which, for some geographical reason, have not as yet been converted into profitable agricultural lands.

The only Indiana specimen of this species brought to the writer's attention during the last five years was collected by Prof. E. E. Ramsey, of the Indiana State Teachers College, in August, 1934, near Cedar Lake in the northern part of the state. This baby rattler, about the size of a finger and some ten inches in length, not only possessed the typical color-pattern of the species, but also its pugnacious temperament in every respect. The vigilant eye and the briskness with which the little warrior used his fangs, made him a dangerous adversary while in captivity. Its hostile disposition was properly emphasized on one occasion when the little captive, almost within the twinkling of an eye, sank his fangs into the index finger of the writer's left hand. The distress and swelling that followed the bite were not to be regarded with unconcern. It is understood, of course, that young rattlers are born with fangs and are venomous as a rule within a few hours after birth.

The prairie rattler has an olive-gray body color with a longitudinal series of rounded dark blotches edged with white on the back. There are two lateral rows of alternating smaller spots along each side. The underneath is blotched with black. The color-pattern on the side of the head is very distinctive and readily recognized. A rather broad dark band, bordered with narrow yellow lines, extends from the mouth diagonally downward.

Notwithstanding its nervous temperament, the prairie rattler seems to adjust itself more readily to captivity than the timber rattler. In the course of a few weeks a large prairie rattler, while confined to a

cage in the laboratory, very eagerly killed and consumed its prey. It seemed to possess a peculiar fondness for rats, particularly rusty alley rats, and it often engulfed several at a single meal.

In the open this snake shows little or no signs of retreat. It is a sturdy warrior and has ultimate confidence in its deadly fangs. On several occasions, while trying to photograph the animal in the act of crawling, the writer was alarmed at the briskness with which it would stop, reverse, and whip its body into a fighting position. There was never a doubt about the sincerity of its motive.

The common or banded water snake (Photo No. 13) erroneously called the water moccasin, is abundantly distributed about the bayous and streams of Indiana. This species is non-poisonous but rather ill-tempered. It often fights viciously when captured and its teeth are capable of bringing the blood profusely.

The water snake resembles the copperhead in appearance superficially, but differs in many respects. The reddish-brown bands on the body of the water snake are wide at the mid-dorsal line and narrow at the sides. Moreover its head is relatively small. It is always in or about water rather than in dry rocky highlands as in the case of the copperhead.

The food of the water snake consists of frogs, salamanders, and fish which are engulfed under water. This species readily adapts itself to aquariums and shows no hesitancy in taking food in captivity. A scramble between two of these reptiles over a frog often results in a tragedy for the smaller of the two contestants. The more successful of the two not only swallows the frog, but often his smaller comrade that is grasping the other end of the prey.

The water snake, like the rattler and copperhead, also gives birth to young, but the broods are much larger, often ranging in number up to sixty-five. On two occasions adult females gave birth to young in our laboratories—the first to thirty-nine and the other to forty-five. Parturition usually occurs about the first of August.

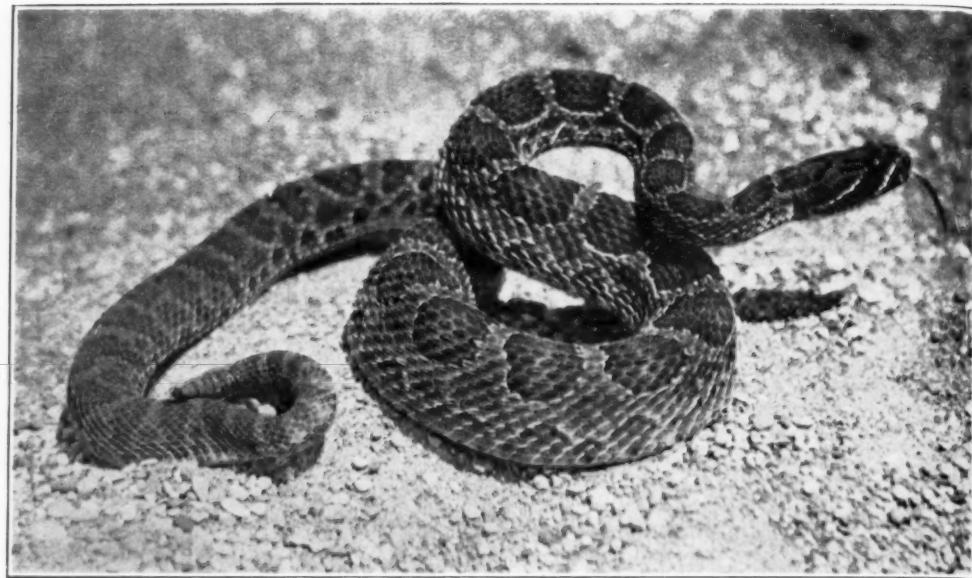


Photo No. 12. Prairie rattlesnake (*Crotalus confluentus*) coiled in striking position—body length, 5 feet.

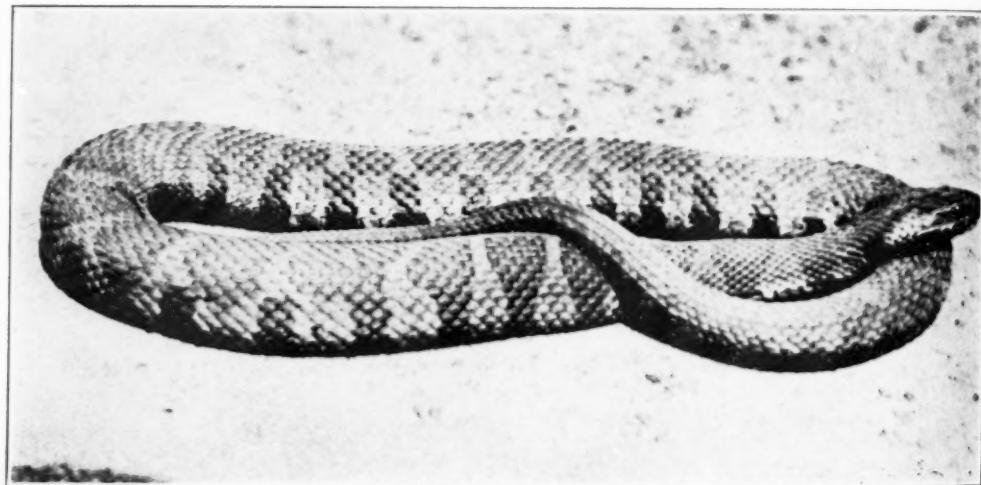


Photo No. 13. Banded water snake (*Tropidonotus fasciatus sipedon*)—body length, 3 feet 6 inches.

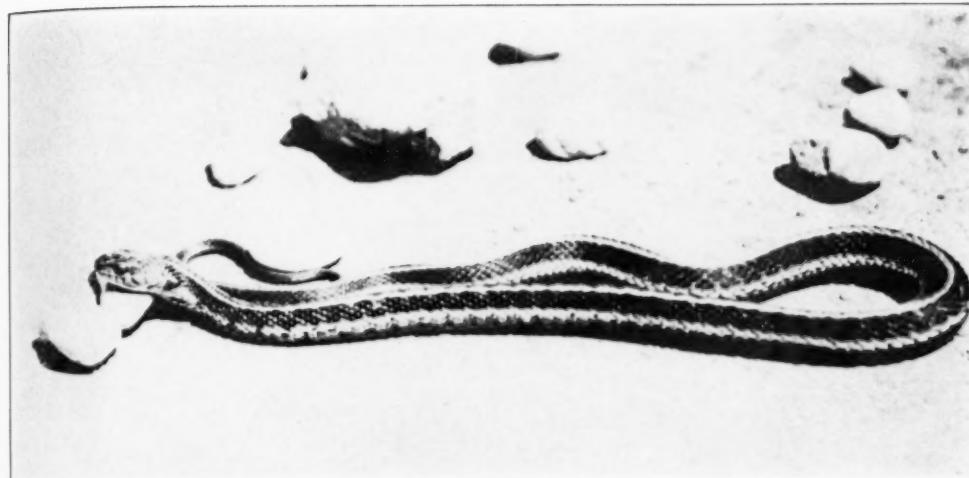


Photo No. 14. Common garter snake (*Thamnophis sirtalis*)—body length, 2 feet.

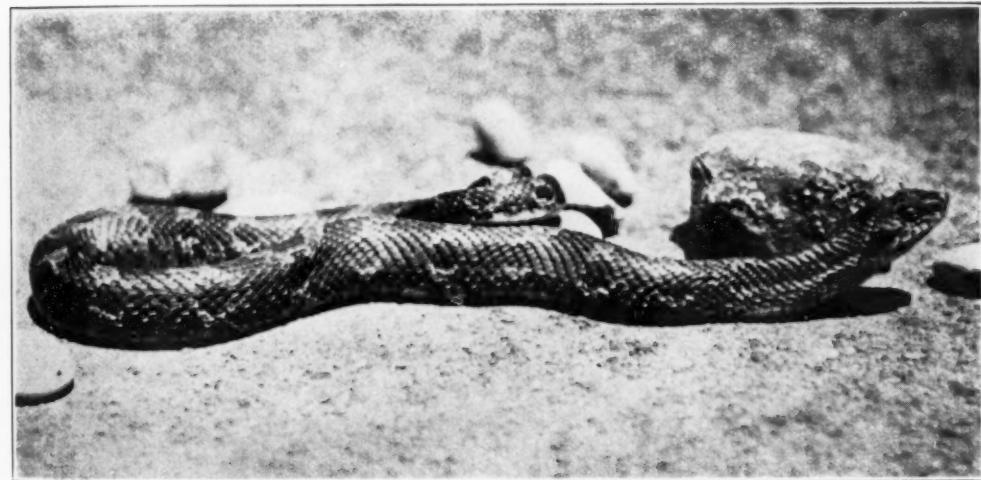


Photo No. 15. Spreading viper or hog-nosed snake (*Heterodon platyrhinos*)—body length, 30 inches.

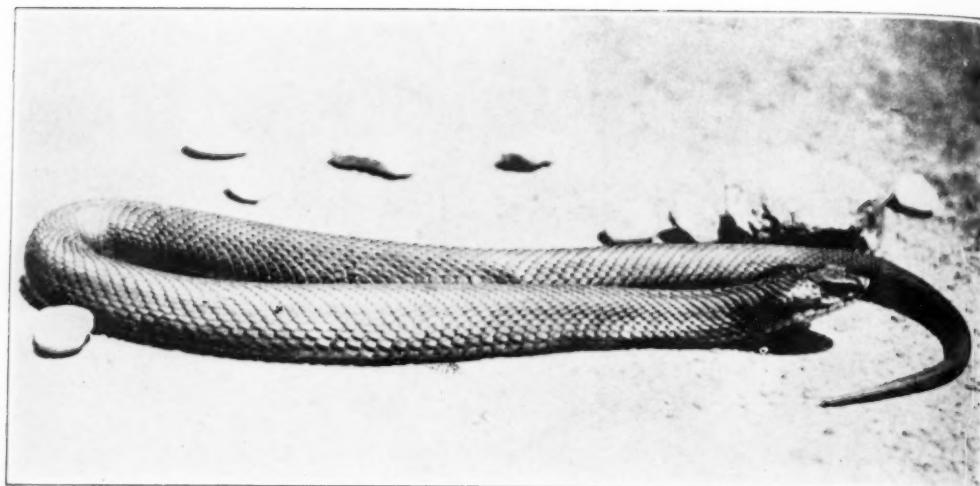


Photo No. 16. Spreading viper, black phase (*Heterodon platycephalus niger*).

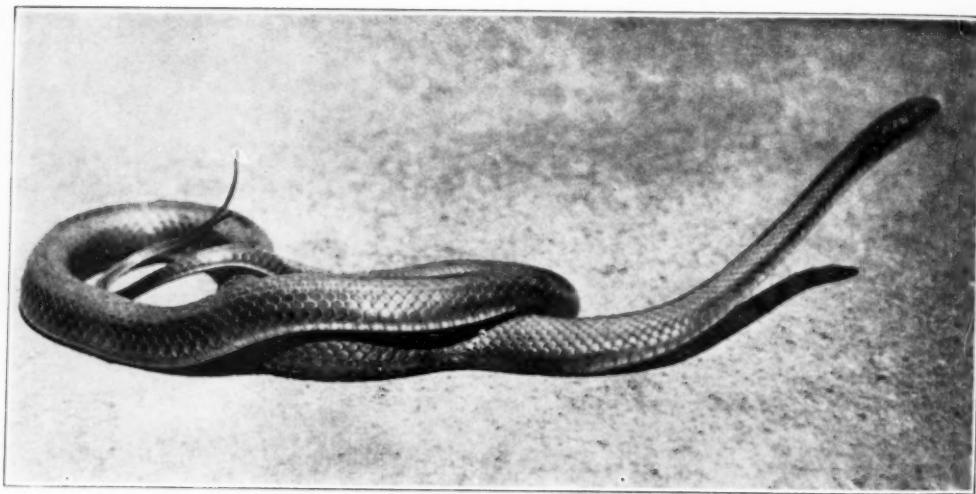


Photo No. 17. Black snake (*Coluber constrictor*)—body length, 6 feet.

The common garter snake (Photo No. 14) is one of the species of the garter snakes in Indiana, all of which have three longitudinal yellowish stripes on the body. The color of the stripes varies with the species. The ribbon garter snake is the smallest and the stripes are bright orange in color. The stripes on the other two species, *sirtalis* and *parietalis*, are dull. The species, *parietalis*, may be recognized by brick-red lines along either side of the body, somewhat obscured by the scales.

The garter snakes are viviparous and the

reputation bestowed upon this animal, it is distinctly harmless.

The color patterns of the spreading vipers are extremely variable. There are hardly two individuals with exactly comparable designs. The patterns range from a gray body color spotted with orange, old gold, or yellow (Photo No. 15) down to an immaculate gunmetal black with slate-colored or salmon-colored underparts (Photo No. 16).

The spreading viper is the greatest showman in all the snake world. Upon being ap-

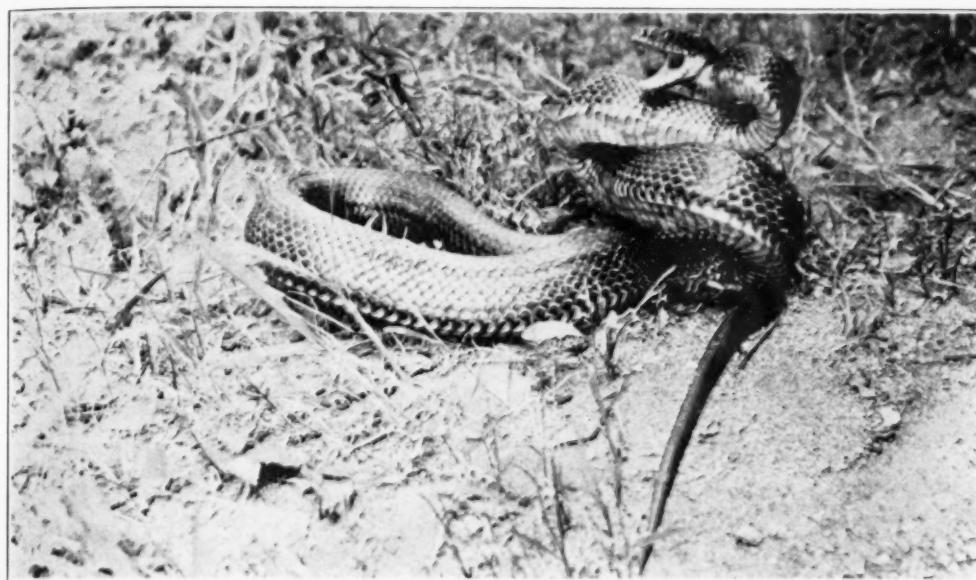


Photo No. 18. Pilot black snake (*Coluber obsoletus*)—body length, 5 to 6 feet.

broods are very large in number. A specimen collected in Brown County this spring gave birth to seventy-one little dynamic offspring while in captivity.

Earthworms, toads, and insect life comprise the greater part of the food of these snakes. It is understood that they are absolutely harmless, and do not deserve the unfortunate lot that befalls them.

The spreading viper (Photos No. 15 and No. 16) is called this name because of its peculiar faculty of spreading its head and blowing when suddenly approached. The name hog-nosed snake is attributed to the turned-up rostral plate similar to the nose of a hog. Notwithstanding the gruesome

approached, this fellow spreads his head and blows violently. With an elaborate display of vicious pantomime and weird antics, he almost paralyzes his audience with fear during the little drama. But he is only a showman. When pushed to the limit, the spreading viper drops the curtain to the first act of his show, opens his mouth, lets his tongue hang carelessly out, often dragging in the dust, flops on his back, and feigns death.

The spreading viper feeds chiefly upon hop toads and small rodents. It is oviparous and deposits about twenty-four eggs during July.

The common black snake (Photo No. 17) is probably the most familiar of Indiana

snakes. This reptile is an immaculate, satiny black above, with a white chin and solid slaty-blue underparts. After shedding during the warm summer months, this reptile travels with great speed, hence, the name black racer. The color varies somewhat before and after shedding. The brighter color subsequent to the shedding has given rise to a notion that a second species exists, the blue racer. This is not true in Indiana. There is a sub-species (*flaviventris*), however, west of the Mississippi known as the blue racer. It resembles our black snake somewhat, but its underparts are pale yellow and the body bluish green or dark olive above.

The black snake is oviparous and lays from fifteen to twenty-five eggs, secreted under stones or soft moist soil, during June and July. The young are quite different from the adults in color. They have a series of rather large dark spots on a gray body.

This species is an omnivorous feeder, eating both warm and cold-blooded prey, such as eggs, young birds, field mice, rabbits, frogs, and the like. It is also the cannibal among snakes, being very fond of garter snakes and water snakes.

The black snake is, of course, non-venomous. It will fight viciously, however, when cornered but retreats with astonishing alacrity when a chance to escape is possible.

The *pilot black snake* (Photo No. 18) is also one of the most common in Indiana. It can be distinguished easily from the black snake by the whitish edges to the black scales, a tinge of pink on the skin beneath the scales, and a checkered abdomen. Moreover, its temperament is quite different from that of the black snake. The pilot snake is a sturdy, conservative warrior. It lacks the nervousness and agility of the black snake. This fellow will stand and fight bravely with little or no attempt to retreat to cover. There are several phases of this species ranging from an anthracite black, with the markings just described, to lighter phases which approach an ashy gray.

In some localities it is commonly called "chicken snake," but, more especially, it should be known as the "rat snake." The

pilot black certainly will not refuse a meal of small birds, but expresses a profound appetite for rodents, such as mice and young rats.

This species also lays eggs, some twelve or more, during the month of July. It should be recognized by its excellent skill in climbing and may be frequently observed at unusual heights, lurking in trees.

Two Other Familiar Species.—Our story would be far from complete if mention were not made of the docile and harmless little insectivorous *green snake* that frequents the garden and shrubbery about the home. Also, the jovial good-fellow, the *chain king snake*, the traditional enemy of the rattle snake, should have an introduction. This species is a glistening black with a stippled chain effect of white on the back and with a yellow-mottled abdomen. The king snake is a constrictor and demonstrates his skill on the venomous species. Fortunately he is immune to their venom.

LIZARDS

The *blue-tailed skink* (Photo No. 19) is one of the most common of the several



Photo No. 19. Blue-tailed skink (*Eumeces fasciatus*)—body length, 8 to 11 inches.

species of lizards in the state. Lizards differ from snakes in that they have four legs,

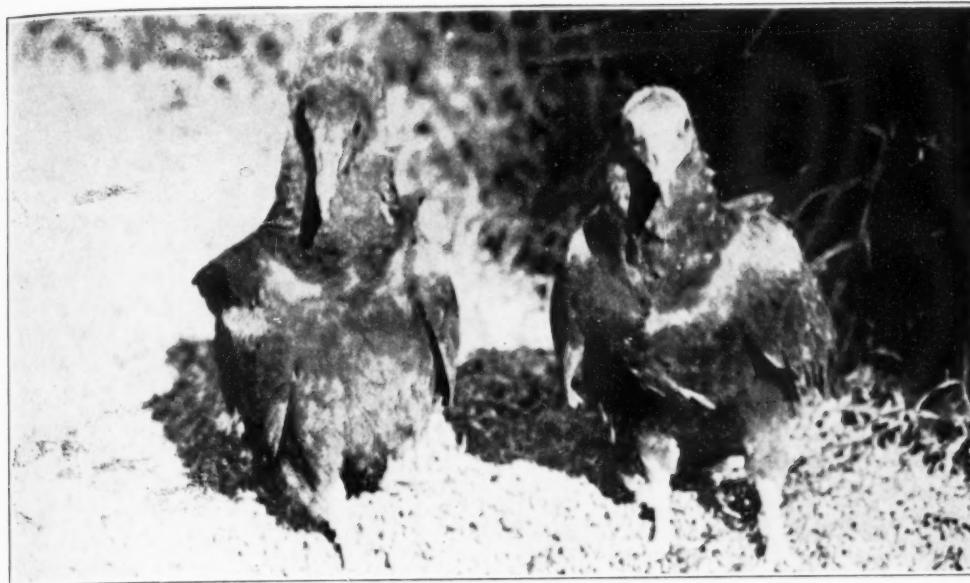


Photo No. 20.
Black vulture (*Coragyps urubu*)—body
length 24 inches.

Vultures.
Turkey vulture or turkey buzzard
(*Carthartes aura septentrionalis*)—body
length, 30 inches.



Photo No. 21. Immature black vulture.



Photo No. 22. Immature turkey vulture.

as a rule, and their jaws do not disarticulate to accommodate large portions of food. Lizards as a whole live upon insects and other small animal life.

The adult blue-tailed skink can be recognized by an olive gray body, reddish copper-colored head, and a faintly blue tip of the tail. The young, which hatch from eggs, differ radically in color from the adults. The young are a rich, shiny olivaceous brown with five distinct longitudinal yellow stripes and a blue tip to the tail. As the young grow older the stripes fade and the head takes on a coppery hue.

There are no poisonous lizards in Indiana, and only one in North America, the Gila monster of the Southwest. Furthermore, the poisonous properties of the Gila monster have doubtless been exaggerated.

The teacher of biology is justified, no doubt, in dealing with the subject of reptiles in such a manner that our next generation may be able to release some of the shackles of mere tradition and be governed by the facts involved before formulating opinions or certain prejudices against this group of unfortunate subjects.

SOME OF OUR LARGE INDIANA BIRDS (CLASS—AVES)

Birds are one of the most interesting groups of animals and offer an abundance of material for fascinating study and pastime. Indiana is fortunate in being able to boast of about 325 species of these feathered friends. It is obvious that space will permit the introduction of only a few species. It is considered expedient that a few of the larger species that hover around the more distant haunts of the state be presented, rather than the many familiar little song birds with which we are all acquainted.

VULTURES

There are two species of vultures in Indiana, the black vulture and the turkey vulture, the latter being by far the more common. Of some nine nests under observation during 1933, only two were of the black species. The specimens shown in the photographs (No. 20, No. 21, and No. 22) were taken at Hoosier Highlands from the caves about the rock cliffs. The black vul-

ture is somewhat the smaller of the two, with a black head, black body, and ivory-colored shafts in the primaries. The turkey vulture is turkey-brown in color and has a red bald head as an adult.

The nesting and foraging habits of the two species are very similar. The nests are poorly prepared of a few dead leaves on the ground, and secluded in caverns of rock caves or hollow logs and trunks of trees. One nest of the turkey vulture was discovered in the hollow trunk of an old sycamore tree in a cow pasture near Marshall, Indiana.

The eggs are rather large, about the size of a turkey egg, and mottled with brown and dull violet. The young of the black vulture is covered with a cinnamon-brown down and appears to be wearing a fluffy hood. The baby turkey vulture, on the other hand, is snow white.

One is forced to marvel at the ease and grace with which these birds negotiate the atmosphere in their pursuit of food. The tremendously large wing expansion doubtless makes it possible for the bird to tread the air with almost imperceptible undulations of the wings; further, the circular course of the flight expedites the feat due to a net gain in energy from the force of the wind against up-turned feathers at the bird's back, when it is moving with the wind, as opposed to the resistance met when the bird faces the same currents with the feathers smoothly plastered against the body.

Vultures are typical scavengers and the very personification of patience. They are not aggressive, but restrain the pangs of hunger until the prey is dead. There is no indication, however, that they prefer rancid meat. Vultures gorge themselves when food is plentiful and are often forced to dispense with some of the store before taking to flight. The young insert their heads into the mouths of the parents and food is transferred directly. Strangely enough, on one occasion a young vulture was billeted in a garage with a pet crow that was perpetually squawking. The crow soon discovered the danger in not keeping his mouth shut, since the little vulture insisted on running his head in "Jim's" mouth. In case of a brief lapse of memory, the clever little

crow would squawk and then dodge to prevent a calamity.

Whether or not the vultures find their prey by the sense of sight or smell is not well determined. Some two years of experience with these birds as pets would indicate to the author that they probably

ganized. Three heronries exist in Indiana to my knowledge—one near Frankfort, another near New Castle, and a third near Noblesville.

A correct picture of the living conditions existing in a densely populated rookery is difficult to describe. If one can imagine



Photo No. 23. Rookery of black-crowned night herons (*Nycticorax nycticorax naevius*) near Frankfort, Indiana. (Note the nests in trees.)

use both senses as might be expected. Doubtless the sense of smell attracts the bird to the general vicinity of the food, and then the eye directs the search at close range.

The birds are very congenial in captivity and make excellent pets, particularly the black vulture. Two of these birds were fed as babies until they learned to fly. They still persisted in making their home in a garage, returning at night from long flights to the country during the day. The black vulture could be seen approaching as a mere black speck on the horizon at evening. When above the house, soaring in a path of concentric circles in a cork-screw spiral, he would land with superb accuracy in the back yard.

WATER BIRDS

Black-crowned night herons are sparsely distributed about the state, but where they are found, usually immense colonies are or-

a four-acre wood-lot supporting some 200 pairs of herons about the size of hens, the trees plastered white with the exudate, twelve to eighteen nests the size of a bushel basket per tree, the young and old birds "squawking" and regurgitating half-digested fish four to eight inches in length, and the fluttering and flapping of a great troop of wings, one is beginning to visualize an avian carnival about a heronry at feeding time in the evening. These birds are largely nocturnal in their habits and feed almost entirely upon fish.

The adult birds (Photo No. 24) are stately fellows with a glossy, greenish-black on the crown and back. The primaries and underparts are a light steel-gray. The eyes are red and the beak and legs yellow. Three long white plumes wave like silken threads from the black crown of the adults during the nuptial season. The eggs, usually four in number, are somewhat small-



Photo No. 24. Adult black-crowned night heron (*Nycticorax nycticorax naevius*)—body length, 24 inches.



Photo No. 25. Young black-crowned night heron.



Photo No. 26. Little green heron (*Butorides virescens*)—body length, 18 inches.



Photo No. 27. Young green herons in nest with egg.

er than hen's eggs and are a pale greenish blue.

The young birds (Photo No. 25), quite different in color from the adults, are tawny-brown with an irregular striping of dirty tan at the center of the feathers. In size, and in contour of body, beak, and legs, the full grown young exhibit the species' characteristics.

The black-crowned night herons are mi-



Photo No. 28. American bittern or Indian hen (*Botaurus lentiginosus*)—body length, 23 to 28 inches.

gratory. They appear at the rookeries about the middle of April and depart in autumn, after the nesting season, to their winter resorts in regions around the Gulf of Mexico and farther south.

The green heron (Photo No. 26) one of our most numerous and generally distributed marsh birds, is a beautiful lustrous dark green, as might be expected from its name. The neck and breast are purplish cinnamon color, obscurely streaked with white. A body length of eighteen inches, due to length of the bird's beak and neck when extended, is somewhat misleading to the observer. The body of the green heron is small and extremely thin. Marsh birds are all waders with long legs and U-shaped

necks which facilitate striking water prey at a rather long range.

The favorite haunts and nesting sites of the green herons are confined to low marshy regions of the community. Everyone has observed the characteristic unpleasant "squawk" and the awkward flight of this species as it leaves its nest in the willows of these neglected areas. The nests are poorly constructed of sticks about fifteen feet from the ground in the small branches of trees. The four or five small eggs are pale blue. The young herons are sufficiently homely to be exceedingly interesting. At first they appear as a huge mouth with just a little bird stretched around it.

The photographs (No. 26 and No. 27) were taken of a family of green herons about fifteen miles south of Terre Haute in an old marsh. The food preferred by this species was brought to the attention of a biology teacher in the Terre Haute schools when one of these birds not only chose to feel perfectly at home about an aquarium in the schoolroom, but also chose to appropriate all the gold fish for its luncheon that day.

The American bittern, stake driver, thunder pumper, or Indian hen (Photo No. 28) has been denominated with various names, some of which arose from the unique sounds that it makes. The marsh call of this bird sounds much like that produced by an old wooden pump or by the driving of a stake into swampy ground. The location of the sound is somewhat deceiving since the beak is partially submerged in water while the call is being made.

The habits of this bird are very similar to those of the little green heron, but its size and color are quite different. The American bittern is a beautiful tawny-brown with pea-green legs, and a well-defined long black patch on the side of the head and neck.

The bird in the photograph was found early one morning foraging for gold fish in a pool in one of the yards at Brazil, Indiana. The bird was wounded and proved to be a very vicious character in captivity.

OTHER COMMON WATER BIRDS

Other rather distant but familiar water birds that should be mentioned are:

The great blue heron—the large slaty-blue fellow seen galloping awkwardly along our rivers. The body length is about fifty inches. Closer scrutiny will reveal chestnut-brown patches along the sides of the neck and breast.

The little blue heron—in general much the same color as the great blue heron but much smaller with a body length of twenty-four inches. The immature birds are white.

White water birds—along our rivers during August and September—about three in number:

a. *American egret*—large; body length, forty inches; snow-white with black legs and orange beak.

b. *Wood ibis*, body length, forty-six inches; white with black primaries and tail; and a large gourd-shaped beak. These are large birds and are found in southern Indiana.

c. *Immature little blue heron*—body length, twenty-four inches; body white with dark blotches at end of primaries; pea-green legs; and lead colored beak. Adult is slaty-blue. This bird is often mistaken for the *snowy egret*. The snowy egret differs in that it has black legs and beak and no dark blotches on the ends of the primaries or flight feathers on the wing.

HAWKS AND OWLS

Hawks and owls, like the snakes, are quite generally misunderstood. It is unfortunate that all species are considered culprits by many people and led to the guillotine for deeds they may not have committed. A survey of some 50,000 crops and stomachs representing seventy-five species in North America indicated that only some six species deserve the treatment they get:

1. Sharp-skinned hawk.
2. Cooper's hawk.
3. Pigeon hawk.
4. Duck hawk.
5. Goshawk.
6. Great horned owl.

It is pathetic that the tribe as a whole pays the death penalty for the deeds committed by these six.

The red-tailed hawk (Photo No. 29) is dark mottled brown above with a brick-red tail. The females and young do not pos-

sess the brick-red tail, but the underparts serve to identify all sexes and ages alike. The breast is whitish, followed by an irregular band of brown blotches across the abdomen, fading to white again posteriorly. The legs are stout and yellow.

This is one of our largest hawks. It is frequently seen scouring the tops of the corn fields and meadows, frightening small rodents frantic with a shrill metallic squeal. Its food consists largely of small rodents. Unfortunately for the red-tailed hawk, the sharp-shinned hawk slips into the poultry



Photo No. 29. Red-tailed hawk (*Buteo borealis*)—body length, 23 inches.

yard and out like a bullet with his prey, and leaves the former to pay the penalty for this misdemeanor.

Regardless of space, one cannot refrain from mentioning our smallest and most common *little sparrow or mouse hawk* that frequents the farm and countryside. This little brown, black-barred hawk is very beneficial in curtailing the devastation done by rodents.

The barred owl (Photo No. 30) rightfully deserved to be christened as the "hoot owl." There is nothing quite so startling and stimulating as the effect produced at night by a convention of these owls along a quiet path in a woodland. The whole

woods seems to reverberate with the outbursts of their startling, almost blood-curdling, hoots.

The barred owl is gray, barred with a

pets, take food readily, and make rapid adjustment to a life about the home or school. They are peculiarly fond of mice or other small rodents. The old hollow trunk of an

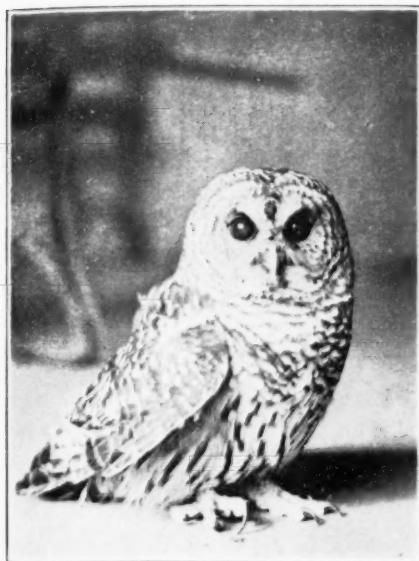


Photo No. 30. Barred owl (*Strix varia*)—body length, 18 inches.

dark brown on the back and neck, but the abdomen is streaked longitudinally. The eyes are jet black. The young are reared in the hollow trunks of large trees and their feeding habits indicate that they are chiefly beneficial.

His big brother, the great horned owl (*Bubo virginianus*), is called the "laughing hoot owl" because of the chattering and chuckling character of the hoot. This owl is much larger than the barred owl. The body is dark gray and buffy brown and two long tufts of feathers protrude like horns from above the yellow eyes. The huge vicious talons together with a peculiar predilection for poultry and game birds has put this species on the black list.

The screech owls (Photo No. 31), strangely enough, do not screech. There are two phases of this species, the brown phase and the gray phase, which have nothing to do, apparently, with sex, age, or season. The gray phase is probably the more common.

The tiny screech owls make excellent



Photo No. 31. Screech owl (*Otus asio naevius*)—body length, 10 inches.

apple tree in the orchard is a paradise for the screech owls. It forms both a summer home for securing the fledglings and a winter refuge from the bitter winds.

The barn or monkey-faced owl (*Tyto alba pratincola*) with its delicately tinted tawny-brown body and face much like that of a monkey, should at least be mentioned because of the unique reputation established for destroying rats.

MAMMALS (CLASS—MAMMALIA)

This class of animals is characterized by the presence of hair on the body and mammary or milk-secreting glands for postnatal care of the young. The larger mammals in their native state have pushed their frontiers westward ahead of the steady march of civilization until, finally, they were forced into extinction except for a few stragglers of the species that are now housed in our national parks. Many of the smaller species, probably due to a size that made refuge from this crusade possible, have survived.

MEAT EATERS

The red fox (Photo No. 32) still is rather common, especially in the hilly, wooded regions of Indiana. Doubtless intelligence and cunning are responsible for his survival.

clothing. The body is relished also as a food; the meat is tender, sweet, and well-flavored.

It is extremely rare to find a raccoon out of doors in daylight. It is nocturnal in habits and roams cautiously about at night



Photo No. 32. Red fox (*Vulpes fulvus*)—body length, 45 inches.

There are several color variants of this species; often noticeable variations occur within a single litter of young. The usual color is a rich rusty or reddish-gray with black feet and ears. Other individuals are black with white-tipped tails and some, the silver foxes, are black with the outer ends of their hair white.

The food of foxes constitutes quite an elaborate menu—rodents of every sort, (rats, mice, and gophers), frogs, lizards, insects, and often fruit and berries. The fox is exceptionally fleet and runs down much of his prey. He may dig it out of the ground, or stalk it by his cunning craft, lying "dead" until the unfortunate victim approaches and then seizing it cat-like. When nursing a litter of pups in the spring and summer, this animal may become an inveterate thief about the poultry yard.

The raccoons (Photo No. 33) are decreasing rapidly in numbers largely because their homes and favorite haunts are being destroyed and their fur used for

in search of food. This species is omnivorous but has a peculiar weakness for roasting ears. It is also fond of fresh water mussels, a habit which it holds in common with the muskrat. Flesh of any kind, turtles' eggs, fish, and fruits are other familiar items on its bill of fare. The raccoon has a mania for washing its food; hence the specific name, *lotor, the washer*.

The raccoon prefers hollow trees, and the young, three to six in number, are born about April. Recently a family was located within one hundred yards of a house about fifteen miles south of Terre Haute. The young make excellent pets, take milk readily from the bottle, and become as domesticated and playful as little kittens.

The opossum (Photo No. 34) possesses a rather unique combination of unusual attributes. It probably represents the lowest round on the mammalian ladder. The blundering, awkward habits of life and apparently low type of intelligence arouse a question as to how it has survived. The

question is probably answered in terms of its nocturnal habits, relatively small size, life in the woods, its willingness to eat almost anything, and its tremendous rate of reproduction.

Several litters of young, ranging from



Photo No. 33. Raccoon (*Procyon lotor*).

six to fifteen in number, are produced a year. The young are born very immature and placed in a pouch on the abdomen where they feed, attached to mammary glands for several weeks. The young usually stay under the protection of the mother for eight to ten weeks, and scarcely is one litter out of the pouch until another is ready. Recently a young mother with six young in the pouch was captured within the city limits of Terre Haute near a small hen-roost. The family ate and thrived in captivity and showed no signs of melancholy.

When attacked the opossum drops into a limp coil and plays dead "possums." Whether or not the animal purposely feigns death as a protective measure, or is frightened into paralysis, or whether or not the act is an obsolete involuntary habit of ancestral nature is not well-determined. Certainly with an adversary that has attacked the opossum to devour it for food, this habit doubtless would be a dangerous

prank. On the other hand, in merely contesting certain rights to the proceeds of the forest, the act may be of some value to the opossum in a fight to death with a more powerful opponent. Moreover, the fact that the female will fight to death for the



Photo No. 34. Opossum (*Didelphis virginiana*).

protection of the young, complicates the question further.

RODENTS

The groundhog or woodchuck (Photo No. 35) is thought of when the first signs of spring appear. Among the few last reminders of a passing winter, the first groundhog is likely to be seen peeping from his burrow on a warm hillside or near an old neglected fence row in the meadow. It has just awakened from a long, quiet repose in its burrow down below the frost line during the bleak, bitter winter months.

This species is very well distributed throughout the state. A very familiar sight about the countryside is one of these sturdy tawny-gray residents perched upright, statue-like, at the mouth of his burrow, whistling with such shrill piercing notes that his performance is almost startling.

When pursued, this squatly little animal



Photo No. 35. Ground hog or woodchuck (*Marmota monax monax*).



Photo No. 36. Red squirrel (*Sciurus hudsonicus loquax*)—body length, 14 inches.

will retreat as fast as its short dumpy legs will permit; but, when overtaken, it will turn and fight viciously. Those who know this animal hold a deep respect for its defense tactics when cornered. The groundhog is a sturdy warrior and properly quali-



Photo No. 37. Fox squirrel (*Sciurus niger rufiventer*)—body length, 23 inches.

fied to cross swords with most adversaries in its class.

The groundhog is a strict vegetarian and when permitted to multiply unchecked may become destructive to farm crops in certain localities. This species is particularly fond of legumes and the tender shoots of many other plants. This point was properly emphasized to the author when a mother and four young escaped from a cage and burrowed under a garage near the garden. The capacity of this family for green beans, lettuce, and cabbage was almost unbelievable. The animal appears early in the morning while the dew is still on and feeds quite busily. After several hours of quiet in the burrow, it returns again about two o'clock in the afternoon, principally to bask in the sun and to extend its acquaintance about the countryside. About sundown the animal appears again to enjoy a sumptuous repast of the evening before retiring into its burrow for the night.

The woodchuck produces, usually, two litters of young per year, ranging from three to six in number. The body of the animal is short and compact and well laden with sweet, palatable meat. It is difficult to understand why it is not used more extensively as an article of food.

The red squirrel, chickaree, or pine squirrel (Photo No. 36) is probably more common in the northern section of Indiana, but seems to be displacing the fox squirrel as the frontier is extended southward. The red squirrel is a rusty color with under-parts of pure white. The tail has a sub-terminal black band with a tan fringe. This squirrel is somewhat too small to be very popular as a game animal. Nuts constitute the greater part of its food; but it is repeatedly accused of destroying a great number of birds' eggs and even young birds.

The fox squirrel (Photo No. 37) is probably destined to survive his unfortunate cousin, the gray squirrel, which is gradu-



Photo No. 38. Flying squirrel (*Glaucomys volans volans*)—body length, 10 inches.

ally approaching extinction. The axe of the lumberman and the sport of the gunner seem to have worked a greater hardship on the gray species. On the other hand the fox squirrel appears to fare exceedingly

well in open wood lots, especially adjacent to corn fields.

The fox squirrel is larger than either the red or gray squirrel. The body is rusty above, tinged with black, and the underparts are ashy gray.

The *flying squirrel's* (Photo No. 38) name is somewhat misleading when applied to this little animal, insomuch as it does not actually fly in the same sense that birds do. Broad webs or flaps are attached between front and rear legs which, when extended, increase buoyancy and make it possible for the animal to glide some distance



Photo No. 39. Striped gopher or striped ground squirrel (*Citellus tridecemlineatus*)—body length, 10 inches.

from tree to tree. There are no wings or undulations of parts of the body whatsoever during its course.

The beautiful little squirrel is not much larger than a half-grown rat and delicately colored above with a dull yellowish gray and creamy white below.

The flying squirrel is probably more abundant in Indiana than commonly believed. The small size and meek nocturnal habits have added much to the inconspicuousness of the species. Impacts on the side of hollow trees during the day disturb their repose and often reveal numbers of

these tiny squirrels in communities not known to be inhabited by them. Recently, a hollow tree was cut down a few miles from Terre Haute and, to our surprise, fifteen or twenty of these little strangers sallied forth.

The *striped ground squirrel* (Photo No. 39) is very common in central Indiana and north, but is exceedingly rare along the Ohio River. This extremely nervous little rodent is brownish gray above with about seven light longitudinal lines alternating with six dotted lines. This accounts for his specific name, *tridecemlineatus* (thirteen stripes).

The difficulties encountered in an attempt to photograph this little species clearly revealed its temperament and the alacrity with which it can move and dart to cover.

The striped ground squirrel feeds upon

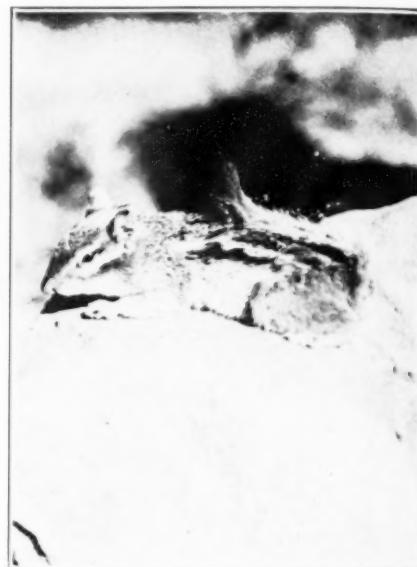


Photo No. 40. Chipmunk or ground squirrel (*Tamias striatus*)—body length, 11 inches.

many varieties of farm crops, including tuberous plants, and may easily prove a serious pest in certain localities if permitted to multiply unchecked.

The *chipmunk* (Photo No. 40) differs distinctly in color from the striped gopher. The body color is a reddish brown with five black and two white longitudinal stripes

above. The rump and hips are conspicuously reddish or rusty. This species is confined to wooded sections and feeds almost wholly upon nuts and seeds.

OTHER MAMMALS

Not to mention other familiar forms that have not been given a place in our short discussion would precipitate a feeling of regret. At least, we may introduce some of them by name. The little brown bat, common mole, skunk, shrews, mink, weasel, rabbit, jumping mouse, meadow mouse, white-footed mouse, muskrat, and occasionally the coyote are all residents of certain

sections of our state, and are found to possess fascinating individualities for those who know them.

CONCLUSION

The few forms of animal life introduced in this brief discussion were not selected with any purposive discrimination in mind, but rather in an attempt to present a few species with which the writer has associated rather intimately.

It is hoped that something has been done of interest to those who desire to know more about this phase of nature's creation.

EDITOR'S NOTE: The pictures used in this article were all taken by the author.

Around the Reading Table

KUHN, C. D. AND OLIS G. JAMISON. *A Directed Study Workbook in American History*. Charles Scribner's Sons, New York, 1934. 169 pp.

This workbook was prepared primarily for a high school course in American history. It covers the entire field from the European background and the discovery of America to the Roosevelt "New Deal." The subject matter has been divided into nine well chosen units. Each unit is planned to fall naturally into three steps. The first is termed the problem setting phase, consisting of the unit title, aims, and a brief overview statement. The second is called the work or self-testing phase, consisting of references to textbooks and supplementary books, map exercises, and problems in the form of an outline and questions. The third is designated the organization and discussion phase which consists of topics for floor talks or special reports, thought questions, and individual investigations. Each unit is also followed by a series of tests of various kinds which may be used as a check on the work accomplished.

The authors are teachers of experience and the workbook is the result of actual classroom experimentation. It is planned especially for classes conducted on the individual study plan basis under the direction of the teacher. It will nevertheless be found useful where the work is carried on by the formal recitation method. Emphasis is placed throughout upon holding students responsible for doing certain things and upon getting them to think for themselves. The references to historical fiction, biography, and poetry should serve to stimulate more interest in the subject

and develop the habit of reading good books as a leisure time pursuit.

Many history workbooks have been published in the last few years. This one impresses the reviewer as the best one, the most practical and usable, that has yet come to his notice.

—Charles Roll
Indiana State Teachers College

TIEGS, ERNEST W., AND WILLIS W. CLARK. *Progressive Achievement Tests*. Southern California School Book Depository, Ltd., Hollywood, California, 1934.

This is a new series of achievement tests for grades one to nine with the emphasis on diagnosis rather than survey. The tests are in three series, Primary for Grades 1-3, Elementary for Grades 4-6, and Intermediate for Grades 7-9. The authors have not attempted to cover the entire range of grade subjects but have limited themselves to reading, arithmetic, and language.

On the cover of each test is a profile chart showing just where the pupil is in each part of the test. Also there is a very complete analysis of the results to be used only with those pupils who are having special difficulties. This is an exceedingly promising feature and enables the teacher to make use of the tests for both survey and diagnostic purposes and with a minimum of wasted time and effort. In language, for example, the profile and analysis show the pupil's performance in capitalization, punctuation, words and sentences, spelling and handwriting.

Just how carefully each test item has been validated is not revealed and the

statement is simply made that the content of the tests conforms to recent courses of study and progressive educational practices. The reliabilities range from .86 to .98 for the parts of the test within the grades for which each series is prepared and the reliability of the complete battery is .97.

From the information at hand and judging by the standing of the authors in the testing field this series of test batteries should prove a welcome addition to the equipment of the teacher.

—E. L. Abell

Indiana State Teachers College.

GUILFORD, J. P. *Laboratory Studies in Psychology*. Henry Holt and Company, New York City, 1934. 289 pp.

These laboratory studies are suitable for use with any beginning course in general psychology but integrate especially well with Woodworth's text. There are sufficient experiments to cover a full year's work. The experiments are mostly of the usual laboratory type covering sensation, perception, memory, imagery, attention, etc., but also include many dealing with personality traits, judging photographs, and the measurement of emotions.

The manual is well illustrated, has abundant reference lists, and provides space for a complete record of all results as well as cross-section pages for graphs. Some attention is given to statistical methods necessary in evaluating results. This manual would seem to be a distinct improvement over other available manuals for courses in general psychology.

—E. L. Abell

Indiana State Teachers College

SMITH, MILTON G. *Workbook in Psychology*. Henry Holt and Company, New York City, 1934. 75 pp.

This workbook is especially prepared for accompanying the Woodworth text. It is essentially a device for stimulating thought. Sets of questions are prepared on the textbook chapters and these are followed by questions involving applications of the textbook material to life situations. A third set deals with special fields of interest. There are also included for every chapter in the text tests composed of new type items of many kinds.

The questions are of a type that would arouse discussion and stimulate original thinking on the part of the student. The test items are well organized and carefully constructed in accordance with the rules for test construction. The use of this book would assist greatly in the complete mastery of the textbook. One weakness would seem to be the absence of any reference material to assist the student in the use of other sources.

—E. L. Abell

Indiana State Teachers College

TYLER, TRACY W., EDITOR. *Radio as a Cultural Agency*. Proceedings of a National Conference on the Use of Radio as a Cultural Agency in a Democracy. The National Committee on Education by Radio, Washington, D. C., 1934. 137 pp.

The Developement of Social Intelligence through Part-Time Education. A Study Made for the Committee on Part-Time Education of the American Vocational Association. Vocational Education Bulletin No. 173, Trade and Industrial Series No. 51, U. S. Office of Education, Washington, D. C., 1934. 67 pp.

Apprenticeship in England, France, and Germany. A Publication Composed of Reports Made Available Through the Department of State. Vocational Education Bulletin No. 176, Trade and Industrial Series No. 52, U. S. Office of Education, Washington, D. C., June, 1934. 35 pp.

Supervised Correspondence Study. The Report of the Conference on the Use of Supervised Correspondence Study Held at Teachers College, Columbia University, International Textbook Company, Scranton, Pa., 1934.

The report contains the following chapters: The Place and Purpose of Supervised Correspondence Study, Guidance and Supervised Correspondence Study, The Local Supervisor, The Selection of Well-Constructed Courses, Accrediting Supervised Correspondence Study, Standardizing Cost Accounting, Initiating a Program of Supervised Correspondence Study in the Local School, and Summary and Problems of Future Development. It also gives the names of participants in the conference, and a comprehensive annotated bibliography.

MC GUIRE, SAMUEL HARRISON. *Trends in Principles and Practices of Equalization of Educational Opportunity*. George Peabody College for Teachers, Nashville, Tenn., 1934. 112 pp.

The purpose of this study was to analyze the plans now used in thirty-nine states for distributing state school equalization funds and to indicate a method of evaluation of such plans. The study was divided into five divisions: (1) philosophy or beliefs underlying the practice of state equalization; (2) history of the development of state equalization; (3) condensed statement, analysis, and summary of existing equalization laws; (4) statement of principles and beliefs and the finding of recent research relative to equalization; (5) summary of trends and principles which have been derived from the other divisions.

